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# **IAEA Staff Training by the Los Alamos National Laboratory Clean Chemistry Team**

## **Dates:**

July 17-21, 2017

## **IAEA Participants:**

Beata Varga – Radiochemistry Team Lead

Zsuzsanna Macsik – Radiochemistry Team

Jane Poths – Mass Spectrometry Team Lead

Guillaume Stadelmann – Mass Spectrometry Team

Gary Eppich – Mass Spectrometry Team

Steffi Konegger-Kappel – Mass Spectrometry Team

Johannes Draxler – Mass Spectrometry Team

Marc Humphrey – Analytical Services Team Lead

Paul Martin – Section Head, Coordination and Support

Catherine Mansoux – Coordination and Support

Stephan Vogt – Laboratory Head, ESL

## **LANL Instructors:**

Robert Steiner

Stephen LaMont

## **Agenda:**

Monday, July 17:

In the morning we received a general overview of cleanroom and sample handling and archiving operations including initial sampling kit construction, sample receipt and logistics and sample screening (both gamma-ray spectrometry and X-ray fluorescence spectroscopy). In the

afternoon we toured the sample analysis laboratories including, radiometry, mass spectrometry, particle analysis and the low-level laboratory.

Tuesday, July 18:

Tuesday was spent working with the radiochemistry team. Topics discussed included, cleanroom protocols used for the chemistry laboratories, labware cleaning protocols, sample ashing and sample segregation to minimize risk of facility contamination and cross contamination. Discussions of appropriate blanks, quality control samples, bulk analysis chemistry and radiochronometry methods also occurred. This day was dedicated to chemistry topics.

Wednesday, July 19:

Wednesday was spent working with the mass spectrometry team. During the morning session we toured the mass spectrometry facilities including both particle and bulk areas. Quite a bit of time was spent in the laser ablation-inductively coupled plasma mass spectrometry, LA-ICPMS, laboratory. This effort is focused on a more cost effective method for in situ particle analysis. We were able to meet with the Coordination and Support Section (Paul Martin and Catherine Mansoux) and Stephan Vogt to discuss quality assurance and quality control efforts and needs. Both Paul and Catherine expressed an interest in LANL support to particle analysis quality control sample efforts. The afternoon was spent in discussion regarding analysis protocols and lessons learned from ICPMS analysis. This discussion only touched the surface of ICPMS applications to NWAL, and it became clear that a more intensive engagement in this mass spectrometry area would be valuable as it is now routinely used for the analysis of NWAL samples.

Thursday, July 20:

Thursday was spent touring the nuclear material laboratories. These tours were coordinated with a visit by David Smith and Timofei Tvetskov (Division of Nuclear Security, Nuclear Forensics). Topics discussed during the tours included improved uranium isotopic composition measurements by gamma-ray spectrometry, new methods recently brought online for carbon-nitrogen-sulfur analysis and halogen measurement in uranium materials, and loading techniques for thermal ionization mass spectrometry (TIMS). Of interest for further engagement is an exchange on TIMS filament prep, and whether the LANL-designed degassing machines might work better than the commercial degassers currently used at the IAEA. Additionally, we are interested in learning more about the IAEA's halogen measurement system, which would benefit our UOC characterization efforts.

Friday, July 21:

In the morning we discussed data review and QA for completed samples. This discussion compared approaches at both the IAEA and LANL. The afternoon was used to answer any additional questions and discuss potential future needs.

**Observations:**

- 1) The staff at the IAEA SAL laboratory are well qualified to support both nuclear and environmental safeguards programs. Their approach to both cleanroom operation and sample processing and analysis are state-of-the-art and comparable to DOE and other international capabilities.
- 2) Laboratory facilities and instrumentation are world class and are more than adequate to meet current program requirements. It is important to note that analytical equipment does have a modest service life so planning for eventual replacement should be included in the long term SAL strategic plan.
- 3) Great care is taken in creating sampling kits and sample management procedures are robust. There has been great improvement in this area over the years which should minimized the risk of kit contamination or sample cross contamination.
- 4) Radioanalytical methods at SAL are quite mature and sufficient for meeting the program's needs. Review of procedures and observation of sample processing demonstrated a mature and robust radiochemistry capability that employs state-of-the practice techniques.
- 5) Technical interaction and engagement between radiochemistry and analysis staff has improved significantly from the past. The staff in each capability area work closely together as a cohesive team. This was demonstrated in the sample discussion meeting on Friday. SAL staff and management should be commended for this high level of teamwork.

## **Recommendations:**

- 1) It is apparent that SAL suffers from the availability of appropriated quality control samples for both bulk and particle analysis. This is not unique to SAL but impacts all NWAL laboratories. We discussed these needs across the program. Ongoing work within DOE may help meet some of these needs. Work LLNL is doing on the bulk QC side and LANL on the particle QC side could prove useful to SAL.
- 2) SAL should minimize staff turnover as much as possible to ensure continuity in operation. Often there is little that can be done in this area but it can effectiveness and efficiency. This does not seem to be as much of an issue as in the past but should still be considered in strategic planning.
- 3) Based on discussions with the mass spectrometry team and SAL management it is recommended that a similar training effort be considered in the area of mass spectrometry. This would involve SAL staff spending time at LANL for focused training and discussion on mass spectrometry methods and lessons learned as they pertain to environmental sample analysis, in particular, the use of modern multi-collector TIMS methods and analysis protocols and data reduction methods for MC-ICPMS data.



